THE REFLECTANCE SPECTRUM OF SYNTHETIC TOCHILINITE

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Last year Kozerenko et al. [1] have presented the results of the first successful laboratory synthesis of tochilinite. Tochilinite (coherently interstratified sulphide-hydroxide phase) is known to be one of the major matrix components of CM carbonaceous chondrites [2]. As a result of earlier experiments, synthetic tochilinite was intimately intergrown with either magnetite or mackinawite [1]. Here we present the reflectance spectrum of pure Fe, Mg-bearing tochilinite synthesized using an improved technique.

For the synthesis of tochilinite we used 40 ml titanium vessels filled in half with a water suspension of ferrous hydroxide with admixture of metallic Mg (Fe:Mg ≅ 4:1). NaOH was added to retain the required pH values (≥ 12). H_2S was bubbled through the starting mixture for about one hour. After this procedure the vessels were closed hermetically and heated to 120-140°C. The duration of the runs described here varied from 10 to 45 days. After the runs, the vessels were cooled and uncovered. The pH values of the liquid products and sulphide sulphur concentrations (ΣS_{2-}) were determined. X-ray diffraction (XRD) data demonstrate that the dried solid material was pure tochilinite without admixture of the other mineral phases.

The biconical reflectance spectra of 3 tochilinite powders synthesized in slightly different conditions were recorded in the range of 0.5-16 μm using Bruker IFS 88 FTIR-spectrometer. The measurements have been performed relative to spectralon and rough gold standard in the H_2O and CO_2 purged environment. The grain size of synthetic tochilinite is about first microns.

Shown in Fig.1, 2 is the reflectance spectrum of the tochilinite sample synthesized for 10 days at 140°C (pH=12; $\Sigma S_{2-}=10^{-1}$ in the initial solution).

The only spectral distinctions between 3 samples are slightly different reflectance levels which could result from the difference in the grain size distribution due to different synthesis conditions. All the samples are very dark as expected for the fine-grained sulphides. Nevertheless, the reflectance spectra display some absorption features both due to electronic and vibrational processes. The spectra show a fall-off shorter 0.7 μm and a weak electronic absorption feature near 1 μm probably due to the ferrous iron (Fig.1). The vibrational features at 2.7 and 2.8 μm (Fig.2) can be attributed to hydroxyl ions (OH^-) located in the different crystallographic sites in the mineral structure [3]. The broad absorption feature near 6 μm (Fig.1) may be due to H-O-H bending if some adsorbed water is present in the samples, though other interpretation is also possible.

The reflectance spectrum of synthetic tochilinite can be used for the modelling of the reflectance spectra of CM carbonaceous chondrites.

The Reflectance Spectrum of synthetic tochilinite: L.V. Moroz et al.

REFERENCES: [1] Kozerenko S.V. et al. (1996) LPSC XXVII, p. 695-696; [2] Zolensky M. et al. (1993), *Geochim. Cosmochim. Acta* **57**, p. 3123-3148; [3] Farmer V.C. In: *The Infrared Spectra of Minerals* (Ed. V.C. Farmer), p. 331-363.

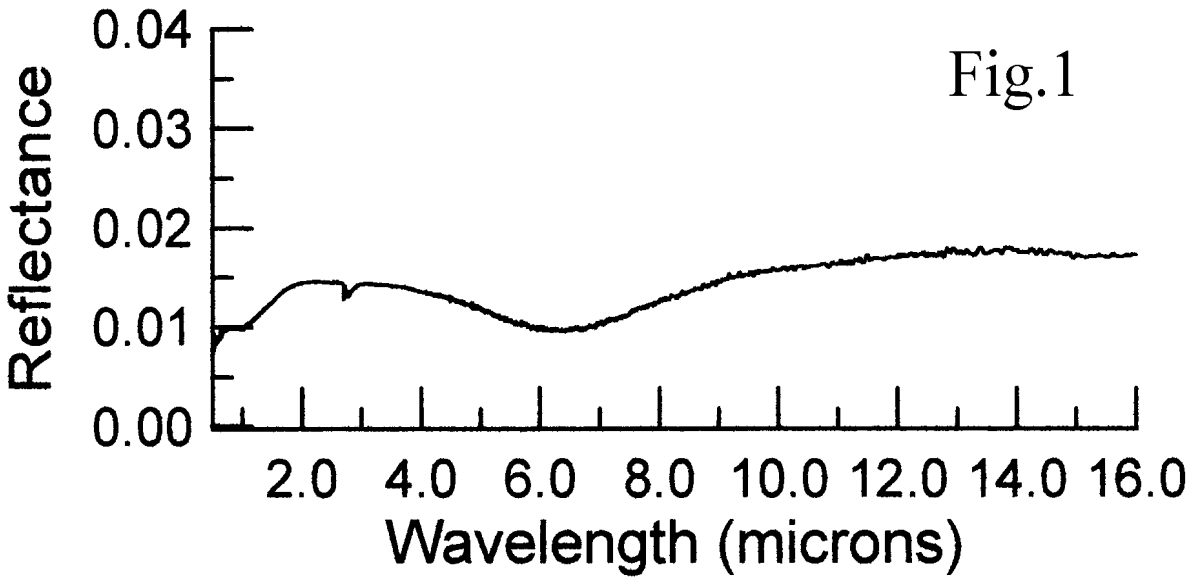

Fig.1

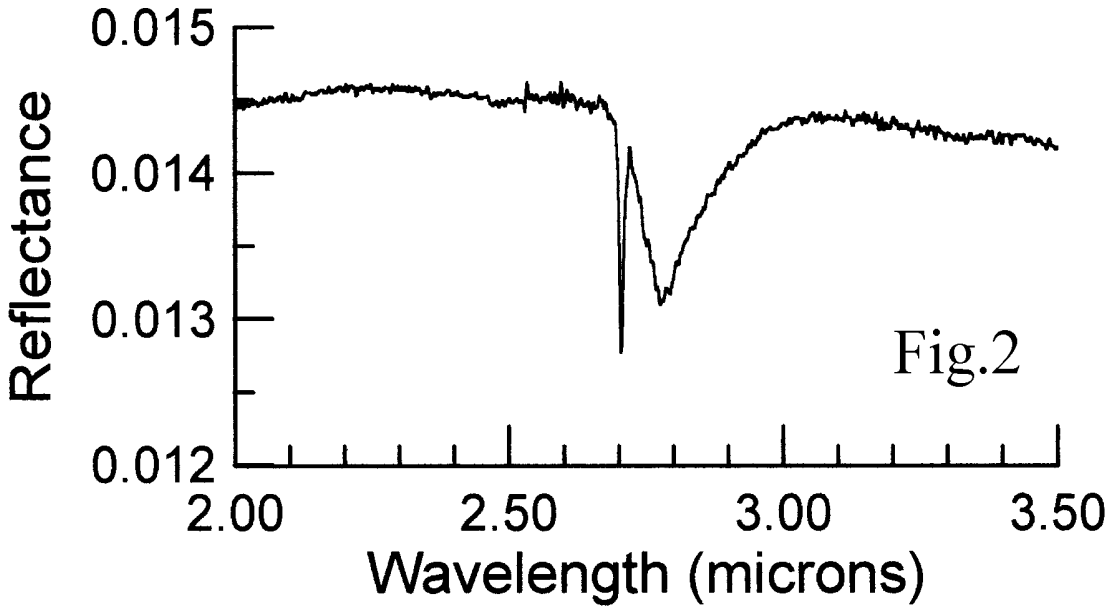

Fig.2